

**Title of Investigation:**  
Conformal Gripper

**Principal Investigator:**  
John M. Vranish (Code 544)

**Other In-house Member of Team:**  
Rud Moe (HST)

**Initiation Year:**  
FY 2004

**FY 2003 Authorized Funding:**  
Zero

**FY 2004 Authorized Funding:**  
\$25,000

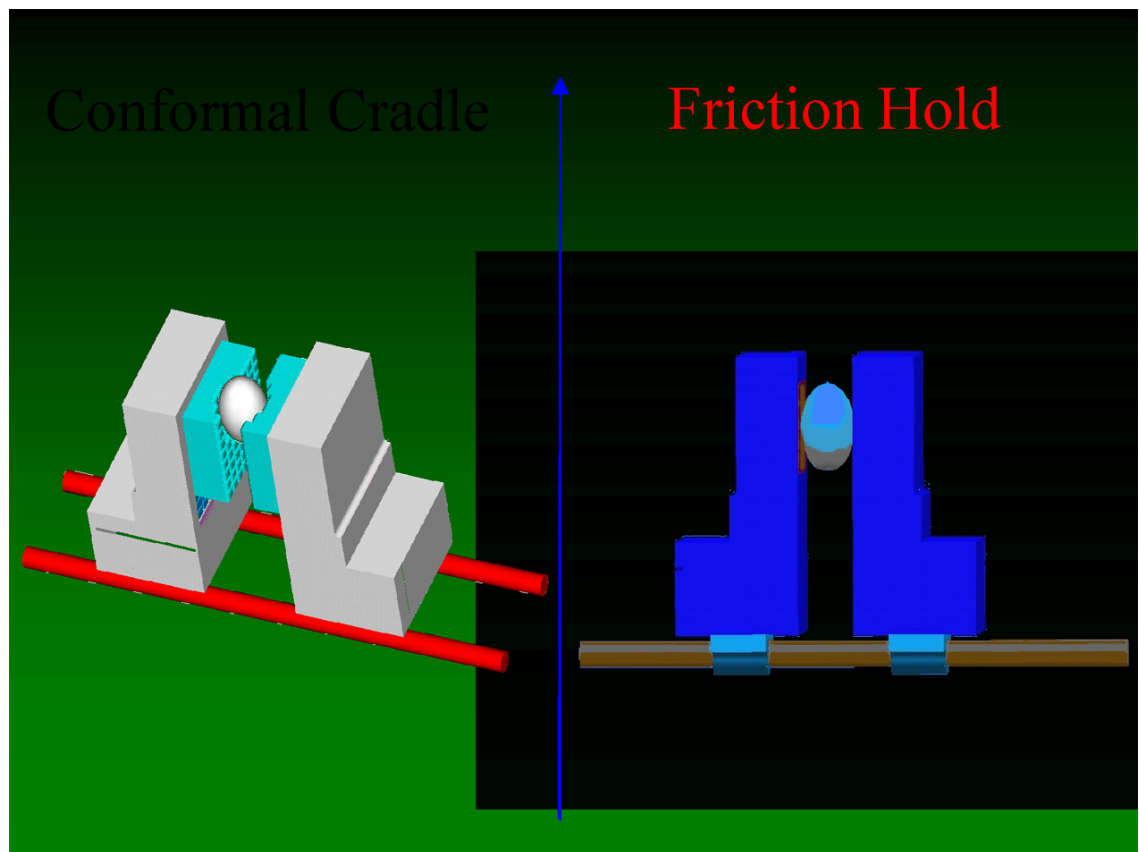
**Actual or Expected Expenditure of FY 04 Funding:**  
Contract with Honeybee Robotics, Inc. to perform detailed design and prototype fabrication.

**Status of Investigation at End of FY 04:**  
Detailed concept has been provided to the contractor by GSFC. Contractor has begun detailed design to include machine drawings.

**Expected Completion Date:**  
October 2005

**Purpose of Investigation:**

A Conformal Gripper for robots, in development at GSFC, enables gripper fingers to conform softly to the shape of any grasped object and to freeze the conformal shape in place, thus trapping the object in a strong and sure cradle hold; while holding it softly. Conformal Gripper presents a new approach in robot materials and tool handling and a new systems approach is needed to exploit its unique capabilities. Specifically, Conformal Gripping permits end-effectors and the requisite end-effector auto change to be replaced by tool bits held firmly and precisely in gripper finger conformal grip. End-effector storage holsters can be replaced by much smaller and simpler tool bit storage bins. A Conformal Gripper capable of continuous wrist rotation can perform many tasks without using tools or tool bits, so the robot wrist must acquire a continuous rotation capability and be electrically set up to get power and signal across the continuously rotating wrist joint. The power and signal must enable the gripper and tool bits to have "virtual feel" sensing. The robot wrist should also be set up to provide an integrated screw driver motor capability to provide gripper/nut runner capabilities.



#### **FY 2004 Accomplishments:**

Detailed concept has been provided to the contractor by GSFC. Contractor has begun detailed design to include machine drawings. Design modifications have improved the load holding capability of the original concept.

#### **Summary:**

Proper robot object and tool handling capabilities are essential to performing useful work on orbit and on the moon. Conformal Gripper represents current state-of-the-art in object and tool handling. It can perform most tasks directly, without grasping tools. It can safely, securely and effectively grasp and use tools to perform a task. It is more capable than a typical parallel jaw gripper

It is simpler than human hand-like grippers and is, for most applications, equally capable. It is more capable than a typical robot tool change-out system and requires much fewer tools and tool storage and the size and mass that attends. Conformal Gripper is capable of “Virtual Feel” pre-contact sensing, essential to precision assembly and disassembly. It is also able to transfer “Virtual Feel” sensing to each tool it holds. Conformal Gripper will be able to transfer electrical power and signal across a continuously rotating wrist joint. It is advantageous for many fastening techniques used in robotic assembly/disassembly. It uses current technical art in an advantageous, novel way to achieve superior results. Thus, it will be able to be implemented in a reasonable time frame. New technologies are in sight which will lift performance and capabilities even more.